

### ABSTRACT OF THE INVENTION

Methods of producing doped and undoped yttrium aluminum garnet and yttrium aluminum perovskite containing powders and the powders produced thereby are provided. Additionally, methods of forming doped and undoped polycrystalline yttrium aluminum garnet having a mean grain size of between about 1  $\mu\text{m}$  to about 3  $\mu\text{m}$  and the yttrium aluminum garnet produced thereby are provided. The doped and undoped polycrystalline yttrium aluminum garnet may be formed by sintering a compact and subsequently hot isostatically pressing the compact.